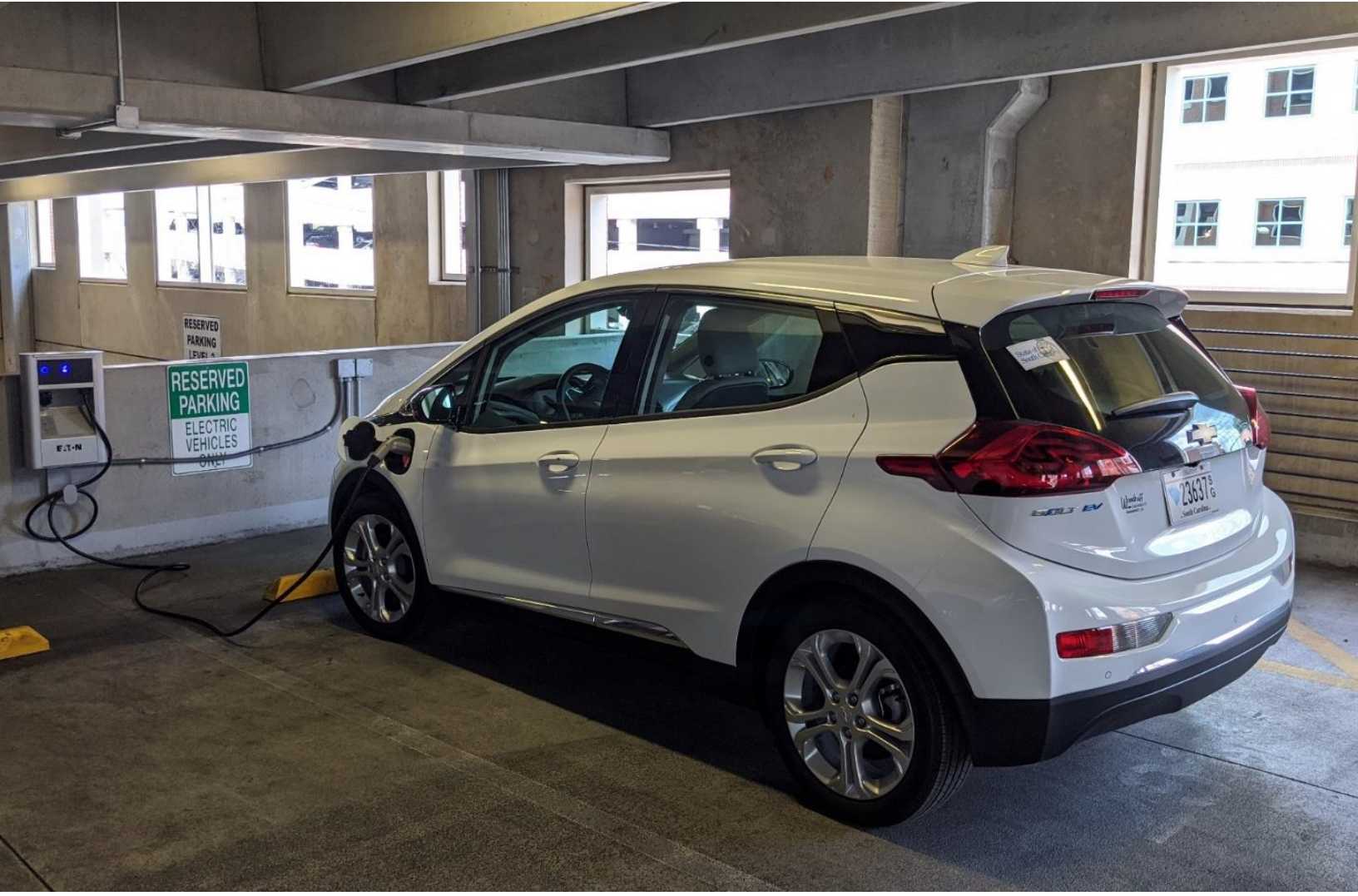


Are Electric Vehicles Right for Your Organization?

An overview of EV basic and benefits

Palmetto Clean Fuels Coalition & South Carolina Energy Office
South Carolina Office of Regulatory Staff
November 2020

Background

State Energy Office

The South Carolina Energy Office, (the Energy Office) transferred to the South Carolina Office of Regulatory Staff in July of 2015, advances South Carolina's energy strategy and policy through education and outreach.

The Energy Office promotes the efficient use of all energy sources. In addition, the Energy Office encourages energy efficiency, renewable energy, and clean transportation through a broad range of initiatives that include:

- Developing the State Energy Plan
- Providing Technical Assistance
- Offering Financial Assistance
- Conducting Education and Outreach
- Maintaining an Energy Data Resource

Palmetto Clean Fuels – South Carolina's Clean Cities Coalition

The Palmetto Clean Fuels Coalition (PCF) is an initiative of the Energy Office. PCF works to increase the use of alternative fuels and advanced vehicle technologies in South Carolina. The US Department of Energy (DOE) approved the application for PCF's designation in 2003, recognizing the commitment of our stakeholders to building an alternative fuels market in South Carolina as a statewide coalition in 2004. Since then, PCF has been part of the Clean Cities program, a network of nearly 100 designated coalitions across the United States.

PCF strives to help public and private entities, as well as individuals, lower fuel costs, improve air quality, and reduce petroleum consumption. PCF also promotes vehicle idle reduction, fuel economy improvements, vehicle miles traveled reductions, and bicycle and pedestrian efforts.

To learn more about Palmetto Clean Fuels and its initiatives visit PalmettoCleanFuels.org.

EV Basics

Types

1. **Hybrid Electric Vehicles (HEVs)**
   HEVs are powered by an internal combustion engine and by an electric motor that uses energy stored in a battery. The battery is charged through regenerative braking and by the internal combustion engine, and the vehicle does not plug in to charge.

2. **Plug-In Hybrid Electric Vehicles (PHEVs)**
   PHEVs are powered by an internal combustion engine and an electric motor that uses energy stored in a battery. The vehicle can be plugged in to an electric power source to charge the battery. Some can travel nearly 100 miles on electricity alone, and all can operate solely on gasoline (similar to a conventional hybrid).

3. **Battery Electric Vehicles (BEVs)**
   This most well-known category of EVs use a battery to store electric energy that powers the motor. EV batteries are charged by plugging the vehicle in to an electric power source.

Charging Levels:

Name	Current Type	Voltage (V)	Kilowatt (kW)	Charging Time
Level 1	Alternating Current (AC)	120V	1.3-1.9 kW	2 to 5 miles of range per hour of charging
Level 2	Alternating Current (AC)	240V	3.3 – 17 kW	10 to 20 miles of range per hour of charging
DC Fast Charging	Direct Current (DC)	480V	50-150 kW	60 to 125 miles of range per 20 minutes of charging

Many state and local fleets may not hit empty during the course of the workday using conventional gasoline, in the same way that an EV may not deplete its entire charge. For this reason, fleets may want to consider a Level 2 charger. This low-cost infrastructure choice will ensure that vehicles charge overnight at their garaged location, having a full battery in the morning.

DC Fast Charging is customarily found along interstates and highways, allowing for a quick boost of energy to reach a destination. DC Fast Charging is not commonly found at fleet locations but can be used to charge many fleet vehicles or heavy-duty equipment faster.

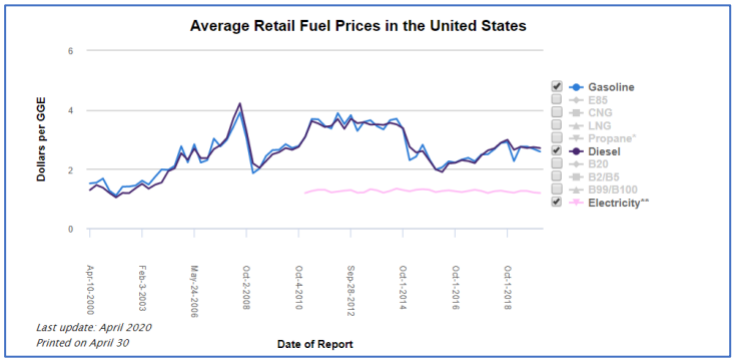
Benefits of EVs

Meeting Energy Goals
A major principle of the State Energy Plan is to "Lead by Example," applying to the state's adoption of alternative fuel vehicles in its fleet. Furthermore, South Carolina's Code of Laws Section 1-11-310(A) of the procurement code promotes vehicle acquisitions that have the lowest total cost of ownership, giving preference to alternative fuel vehicles.

Lower Total Cost of Ownership
EVs have a fraction of the moving parts of gasoline vehicles and diesel vehicles, making them very reliable with warranties exceeding those of traditional replacement schedules. Zero combustion means no oil changes, air intake changes, spark plugs, catalytic converters, or other emissions equipment. There is also less wear on parts such as brakes. Most, but not all EVs, use fixed gears instead of transmissions which further reduces maintenance costs. As a result, EVs only need to be serviced once or twice a year to check vehicle systems and rotate the tires.

Higher Energy Efficiency
An EV electric drive system is only responsible for 15 to 20% energy loss when compared to 64 to 75% for a gasoline engine. EVs also use regenerative braking to recapture and reuse energy that normally would be lost in braking and waste no energy idling. Only about 12 to 30% of the energy from the fuel put into a conventional vehicle is used to move it down the road, depending on the drive cycle. The rest of the energy is lost to engine and driveline inefficiencies or used to power accessories.

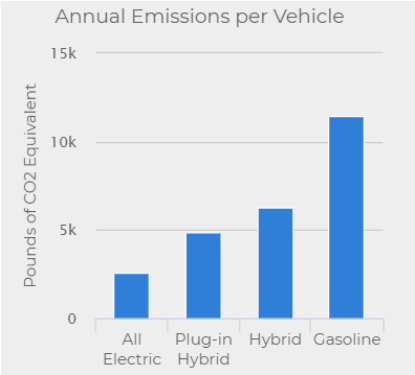
Lower and Stable Fuel Costs
In South Carolina, the current average retail price for electricity is 9.63¢/kWh, and those costs are generally fairly stable. Alternatively, gasoline prices tend to be volatile, causing financial uncertainty. This can affect budgets when gasoline prices fluctuate. The stability of electricity prices combined with the higher efficiency of electric motors result in fuel costs that are typically 50 to 75% less than retail gasoline and diesel. Generally, an "egallon"— or, the cost of fueling a vehicle with one "gallon" of electricity as compared to a similar gasoline vehicle— will be around $1.



AFDC Alternative Fuel Prices

Lower Emissions

Conventional vehicles with internal combustion engines (ICEs) produce several direct emissions: through the tailpipe, through evaporation from the vehicle's fuel system, and during the fueling process. Conversely, EVs produce zero direct emissions. PHEVs do produce direct emissions but are typically lower than those of comparable conventional vehicles.



South Carolina Emissions Per Vehicle

EVs do have some impact on emissions from the electricity generated to fuel them. In 2018, South Carolina's energy portfolio was comprised of 56.3% nuclear generation, 39.5% from fossil fuel sources such as coal and gas, and 4.2% renewables. Even when electricity for powering an EV is produced from coal, the higher efficiency of EVs results in a net reduction of GHG emissions.